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Complications in the Elderly: How to Plan for your Hip Fracture Patient

Patrick Kane*, Adam Miller, Michael Bercik, Fabio Orozco and Alvin Ong

Department of Orthopaedic Surgery Thomas Jefferson University Hospital and The Rothman Institute, 925 Chestnut Street 5th Floor, Philadelphia, Pennsylvania 19107, USA

Abstract

Introduction: Hip fractures represent a significant injury for the elderly population. The incidence of hip fractures is expected to increase as the American population ages and remains active into old age. The purpose of this study was to examine a large series of hip fractures to determine age associations and in-hospital outcomes resulting from this injury.

Methods: Seven hundred and twenty two patients underwent surgical correction of hip fractures at our institution during a ten year period. Patients were divided into two groups: Group A less than 75 years old and Group B greater than or equal to 75. Patient demographics, fracture type and treatment, time to surgery, comorbidities, complications, and mortality rates were analyzed.

Results: No difference was found between the two age groups in terms of fracture and fixation type and time to surgery. Post-operative complication rates, specifically cardiac (2.3 versus 8.2 percent), were significantly higher in the older age group (42.3 versus 60.2 percent). However, in-hospital mortality rates were not found to differ significantly (0.9 versus 2 percent).

Conclusion: Our results highlight the impact hip fractures can have on the elderly population. Although no in-hospital mortality difference was noted, the increased incidence of post-operative complications, particularly cardiac, may contribute to the traditionally high one-year mortality rates and nursing care requirements following this injury. Treating physicians should maintain a high index of suspicion for cardiac events following hip fracture treatment, particularly in the elderly population.

Introduction

Hip fractures are one of the most common orthopaedic injuries affecting the elderly population. In the United States, there are nearly 352,000 hip fractures annually, accounting for up to one third of orthopaedic hospital admissions [1,2]. Additionally, hip fractures account for almost three billion in Medicare spending each year [3]. These numbers are only expected to increase as the American population ages. Nearly 22 percent of the US population will be older than sixty-five years of age by the year 2030, accounting for nearly seventy million people [4]. Given the fact that one out of every three adults falls each year, and that nearly 90 percent of all hip fractures are due to falls, the number of these injuries will increase dramatically [1,5]. By the year 2050, it is estimated that the incidence of hip fracture will double to over 650,000 per year [1].

Increasing age and the presence of co-morbidities have been well established as negative risk factors for mortality following hip fracture [2,6-8]. The overall one year mortality rate following this injury ranges anywhere from 14 to 36 percent, and may reach 50 percent in the extremely old [7-10]. Patients that survive often struggle to reach pre-injury levels of independence and mobility. Nearly 40 percent of patients are unable to walk independently and up to 60 percent require assistance up to one year later [6].

Although the health benefits and increase in longevity from activity and exercise are well documented in the literature, the potential increase in hip fracture occurrence as a result of an increasingly active, elderly population must be taken into account [4,11,12]. Increasing mobility in a population with an increased incidence of balance and coordination difficulties may put these individuals at higher risk for falls and subsequently hip fracture. The purpose of our study was to examine a large series of hip fracture patients treated at our Level 1 trauma center and determine age associations and in-hospital outcomes following this injury.

Methods

722 patients were treated surgically for femoral neck and intertrochanteric femur fractures between 2000 and 2010 at our institution. Following institutional review board approval, these patients were identified retrospectively using DRG International Classification of Disease-9th Rev. codes from a database collected at our institution during that time frame. Victims of poly-trauma and patients that sustained a hip fracture while admitted for a different diagnosis were excluded from this study. Data collected for each patient included age, gender, fracture type, surgical procedure, time to surgery, delay to surgery >48 hours, complications, in-hospital mortality, and pre-existing co morbidities. Patients were divided into two main groups: those patients under the age of seventy-five at the time of injury (Group A), and patients seventy-five years of age and older (Group B). Although sixty five is the traditionally accepted transition age for retirement and old age, we chose seventy five for the age cutoff for our study for a variety of reasons. Life expectancy and retirement age in America continue to climb and an increasing number of older Americans regularly participate in exercise and recreational activities. Increasing the age cutoff to seventy five should better reflect the changing demographics and patient characteristics of today.

***Corresponding author:** Patrick Kane, 11 N 2nd Street Apartment 104, Philadelphia, PA 19106, USA, Tel: 570-294-0639; Fax: 215-503-0530; E-mail: Patrick.w.kane@gmail.com

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Fracture type and treatment

Fracture classification was performed in accordance with the AO fracture classification system. Intertrochanteric femur fractures were designated as type 31-A while femoral neck fractures were classified as type 31-B. Overall there were 403 31-A fractures (Group A= 130, B= 273) and 319 31-B fractures (A= 92, B= 227). Treatment for these fracture patterns was identified by procedure or CPT codes and was grouped into one of three categories: open reduction and internal fixation, hemiarthroplasty (81.52), and total hip arthroplasty (81.51). Only primary surgeries were used in our study design, revision procedures were not analyzed.

Complications and co-morbidities

Post-operative complications were divided into two main groups, medical and surgical. Medical complications were subdivided into systems-based categories, including: cardiac, pulmonary, gastrointestinal, urologic, neurological, renal, and hematological. Cardiac complications included arrhythmia, congestive heart failure exacerbation, unexplained hypotension, and acute myocardial infarction. Pulmonary complications included pneumonia, prolonged intubation, pleural effusion, and acute respiratory failure. Gastrointestinal complications included perforation, bleeding, *Clostridium difficile* infection, obstruction, and bowel ischemia. Urologic complications included urinary tract infection and urinary retention. Neurologic complications consisted of acute mental status changes. Renal issues included acute renal failure. Hematological complications were further separated into post-operative anemia requiring transfusion and also into coagulation disorders including pulmonary embolus, cerebral vascular accident, and deep vein thrombosis. Surgical complications that were analyzed included post-operative wound breakdown or drainage, development of deep pressure ulcers, and return to the operating room for revision or additional surgery from either infection or acute hip dislocation.

Pre-operative co-morbidities were also identified for each patient and included all major medical conditions as well as any previous surgical interventions that conveyed an increased risk, such as coronary artery bypass grafting. The total number of co-morbidities was summated for each patient and was used for data analysis and comparison.

Statistical analysis

Postoperative complications and comorbidities were assessed as categorical variables for presence or absence of the diagnosis. These were then analyzed using Pearson chi-square analysis and fisher exact test where appropriate. Minitab© software was used (v13).

Results

Patient demographics can be seen in table 1. There were 222 patients under the age of 75 that sustained a hip fracture with an average age of 61 (19-74). 500 patients age 75 and older were also included with an average age of 84 (75-102). Males constituted a higher percentage of all hip fractures in the younger age group (36% *vs.* 24% respectively) (p= 0.001).

The results of fracture classification and method of surgical treatment can be found in table 2. There was no statistically significant difference in the percentage of intertrochanteric versus femoral neck fractures between the two groups. Similarly no significant difference was found between the percentage of open reduction internal fixation (ORIF) cases and treatment with arthroplasty (p= 0.146). Although not statistically significant, there was a trend for an increased use of ORIF in the younger age group. Looking at arthroplasty alone, no significant difference was found between the two groups in the percentage of total hip replacement versus hemiarthoplasty either (p= 0.625).

The average delay to surgery in number of days was 1.92 *vs.* 2.12 for groups A and B respectively (Table 3). There was no significant difference in the percentage of patients whose surgery was delayed for greater than 48 hours between the two age groups (p= 0.575).

Total co-morbidities were significantly increased for the older age group (Table 4). The average number rose from 3.0 to 4.0 between group A and B. This was significant (p< 0.001)

Total complications were significantly increased for the older age group (Table 5). The 75 and older age group had a complication rate of 60.2 percent compared to only 42.3 percent in Group A (p< 0.001). Cardiac complications including arrhythmias, congestive heart failure exacerbations, hypotension, and acute myocardial infarction were significantly increased in the older age group (8.2 *vs.* 2.3 percent) (p= 0.003). Also increased in the older age group was the percentage of patients with neurological complications including acute changes in mental status (5.8 *vs.* 1.4 percent) (p= 0.007). Although not statistically significant by strict definition criteria, the percentage of pulmonary complications encountered in the older age group was increased as well (6.8 *vs.* 3.2 percent) (p= 0.051). The pulmonary complications analyzed in our study, again, included pneumonia, acute respiratory failure, prolonged intubation, and pleural effusions. The remainder of the complications analyzed failed to reach a statistically significant difference between the two groups. The percentage of mortality also did not differ significantly; 0.9 *vs.* 2.0 percent for groups A and B respectively (Fisher exact test 0.361).

	Group A	**Group B**	
Number of Patients	222	500	
Average age	61	84	
Males	80 (36)	142 (28)	10.33* **p= 0.001**

All numbers in are percentages, *Chi-squared value

Table 1: Patient Demographics.

	Group A	***Group B***	
31-A	130 (59)	273 (55)	0.977* p= 0.323
31-B	92 (41)	227 (45)	
ORIF	151 (68)	312 (62)	2.109* p= 0.146
81.51	50 (23)	121 (24)	0.239* p= 0.625
81.52	21 (9)	67 (13)	

31-A-Intertrochanteric fractures; 31-B-Femoral neck fractures; ORIF-open reduction internal fixation; 81.51-Total hip arthroplasty; 81.52-hemiarthroplasty. All numbers in are percentages. *Chi-squared values

Table 2: Fracture Classification and Treatment.

	Group A	**Group B**	
Absolute Delay	1.95	2.12	
Delay >48h	37 (16.67)	92 (18.4)	0.315 p= 0.575

All numbers in are percentages

Table 3: Delay to Surgery.

	Group A	**Group B**	**P value**
Total number co morbidities	224	502	
Median number co morbidities	3.00	4.00	< 0.001

*Mann U Whitney Test

Table 4: Comorbidities.

	Group A	*Group B*	*Chi-squared value*	*P value*
Total Complications (n= absolute value)	n = 94 42.3	n = 301 60.2	19.786	**< 0.001**
Cardiac	2.3	8.2	9.117	**0.003**
Pulmonary	3.2	6.8	3.817	0.051
Gastrointestinal	1.8	2.4	0.787#	
Urologic	5.9	8.8	1.833	0.176
Neurologic	1.4	5.8	7.813	**0.007**
Renal	2.7	3.6	0.385	0.535
Transfusion/anemia	11.7	13.8	0.587	0.444
Clot	3.2	4.6	0.808	0.369
Wound infection	6.8	4.4	1.756	0.185
Ulcer	2.3	0.8	0.143#	
Surgical	1.4	1.0	0.707#	
Mortality	0.9	2	0.361#	

All numbers except total complications values represent percentages, #Fisher exact test

Table 5: Post-Operative Complications.

Discussion

The aging American population is becoming increasingly active and mobile. Ever evolving healthcare has extended Americans' life expectancy as well as quality of life in old age. An increasing number of elderly Americans take part in recreational activities as well as dedicated, structured exercise routines. The benefits of physical activity on all aspects of health have been well documented and primary care physicians continue to regularly prescribe exercise as treatment for a multitude of illnesses [4,11,12]. Active lifestyles have far reaching impacts on nearly every aspect of individual health, including increased longevity and quality of life. However, when recommending an exercise program, it is equally important to be mindful of the increasing incidence of physical disability and impairment in the elderly as well. Gait disorders, coordination difficulty, and balance problems increase dramatically with old age [13-15]. It is estimated that up to half of all people over the age of 65 have disability in mobility-related tasks such as walking 0.4 km, climbing steps, transferring, or doing heavy housework [15].

While the presence of a disability can serve as an obstacle in initiating an exercise routine, it can also serve as a major risk for falls. Since an overwhelming majority of femur fractures are due to falls, the presence of a physical disability can have great implications on the development of a femur fracture.

Femur fractures continue to represent one of the major healthcare challenges today: 1-year mortality rates continue to range anywhere from 14 to 36 percent; economic cost continues to be high; and nearly 20 percent of formerly community dwelling patients require long term nursing care [7,16-18]. The results of our study help reinforce the implications hip fractures can have on the elderly population. In our study the 75% and older age group had a complication of 60.2% compared to only 42.3% in the younger group. This represented a significantly increased incidence when compared to the younger cohort. Cardiovascular, neurologic, and pulmonary complications specifically were increased in older individuals in our study. Although in hospital mortality did not differ significantly, the long term effects that these complications may have were not analyzed and may be underestimated. Many of these complications may contribute to the one year mortality rates and nursing care requirements as mentioned above.

Cardiac complications, in particular, were significantly increased in the older age group (2.3 *vs.* 8.2 percent respectively). This result is important for prescribing physicians to recognize when counseling patients on increasing physical activity. Patients with cardiovascular risk factors that might benefit from an exercise routine may also be at an increased risk of a cardiovascular event if they should happen to sustain a hip fracture. Post-operatively, great care should be taken to monitor for any signs and symptoms of a cardiac complication in this population.

Patients in our study had no significant difference in the time or delay to surgery based on age. Although no in-hospital mortality difference was found, our results suggest that older patients with significant cardiovascular risk factors may benefit from a longer period of medical optimization prior to surgery. A thorough, pre-operative cardiac clearance may help reduce the incidence of cardiovascular events in those at risk. The literature reports conflicting evidence on the impact surgical delay can have on hip fracture outcomes [8,19-22]. While surgery within 48 hours of injury is the generally accepted standard for hip fracture treatment, some studies have shown equivalent outcomes for patients with delays greater than two days [8]. Patients with co morbidities, particularly cardiovascular, requiring a period of stabilization before going to the operating room had similar outcomes as patients who underwent surgery within the 48 hour time frame [8].

Demographic analysis of our study revealed a significantly greater percentage of female patients in the older age group. This gender distribution has been previously well documented in the literature. Women are roughly two to three times as likely to sustain a hip fracture then men and almost half of all women that reach age 90 have suffered a hip fracture in their lifetime [1,16]. Women over the age of 75 also have the highest prevalence of chronic disease and disability [14,15]. Physicians should be aware of these realities when recommending an exercise regimen, particularly in the female patient population. Creating a patient-specific program with safety in mind may help to alleviate some of the burden hip fractures can have on elderly women.

Although more common in women, elderly patients across the board are at an increased risk for injury as well as post-operative complications resulting from hip fracture. While it is important for healthcare providers to continue to recommend physical activity, the results of our study highlight the impact hip fractures can have on the health of the 75 and older age group. Thus, as patients get older, physicians may have to consider recommending more low-risk, low-impact activities in this population. Additionally, a high index of

suspicion for cardiac complications should be maintained in the elderly patient following hip fracture treatment.

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